

Summary Paper on 8 Oct 05 AFRL FLTC/ST3 Briefing

This 15 minute briefing will cover an introduction to AFRL's Focused Long Term Challenge (FLTC) investment process and its near-term initiative in the sustainment area, called "Sustainment Transformation Through Technology (ST3)". An example in the area of turbine engine life extension will be quickly covered.

In 2000, Congressional tasking established AFRL's Long Term Challenges (LTCs) where futuristic "If we could/then we could" concepts for the 2050 timeframe were examined. These LTCs were one of the starting points for the FLTC process and led to the elucidation of "Big Hairy Audacious Goal (BHAG) Problems" that face the Air Force. Although our programmatic execution process is still founded in the basic research (6.1), exploratory development of applied research (6.2) and advanced technology development (6.3), AFRL recognized that there was a need for a new far-term Science and Technology vision and process that may provide innovation-driven breakthroughs.

In the late 1990's, then Air Force Chief of Staff, General Ronald Fogleman, established the Air Force kill chain vision as "Find, Fix, Target, Track, Engage and Assess." Earlier this year, Major General Perry Lamy, Commander of AFRL, proposed an expanded AF S&T vision statement that was approved by senior AF leaders: "We will unleash the power of innovative science and technology to Anticipate, Find, Fix, Track, Target, Engage, Assess...Anyone, Anytime, Anywhere (AF2T2EA4). This now comprises the Air Force Effects Chain and forms the foundation from which the eight FLTC's were derived.

FLTC 8, entitled "Affordable Aerospace Reliability and Readiness," will provide a myriad of innovative technological approaches to the age-old issue of sustaining military equipment. Weapon systems of the future will, with these new capabilities, have the ability to monitor their condition, relay that information to the Commander, and potentially reconfigure to maintain mission capability. This FLTC will also work to revolutionize both air and space domain assets in that seamless fashion.

ST3 is the sustainment-focused part of FLTC 8. The goal of ST3 is to maximize the impact of S&T in the sustainment arena by identifying where technology can best help the AF achieve Sustainment transformation goals and by developing joint Lab/Sustainment community planning and investment strategy to achieve those goals. This process requires a high degree of face-to-face collaboration between the users in the ALCs, AFRL scientists/engineers, and AFRL technology transition partners in the product centers and ManTech. Requirements data calls have to date provided minimal value in determining where to invest S&T resources.

ST3 focus groups have been formed in three areas to date: turbine engine propulsion, aircraft structures, and info technologies/Integrated System Health Management (ISHM). Since the propulsion area is by far the most mature, an example in that area, turbine engine life extension, is included.

The first phase of the AFRL Engine Rotor Life Extension (ERLE) program is now nearing completion. The ERLE Spiral I program developed technologies that eliminate components that have the potential to fail, while reusing those that have significant remaining life. Major technology areas included advanced component life assessment processes, enhanced surface inspections, internal defect inspection, and expanded information systems/data mgt technologies. This program was focused on the F100 & F110 families of engines in the F-15 and F-16 fighters, although the technologies are applicable to many more.

In the midterm (through 2009), ERLE will be expanded in a second spiral that matures physically-based life prediction models and associated tools, residual stress measurement & re-application (Ni components), and solid-state devices for surface inspections. A second major midterm effort in this area is the Engine System Prognosis program, a joint program with DARPA that will focus on maturing a combination of state awareness (in-situ NDE) and forecasting (life prediction), and taking a modular approach of looking at end-of-life prognosis, damage accumulation, and remaining capability

These programs will ultimately provide a basis for the FLTC 8 vision in the turbine engine area by allowing high confidence determination of remaining system life based on actual usage; health monitoring at critical locations, and advanced prognosis of aircraft systems

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